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# Measuring Tobacco Use Among Adolescents

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**T**OBACCO USE is the single most important preventable cause of death in our society. Besides causing premature mortality, tobacco use jeopardizes health and well-being and dramatically increases health care costs (1,2).

Because of the impact of tobacco use on mortality and morbidity, the public health community has put enormous effort into persuading people not to start using tobacco and into motivating current users to quit. By 1990, 49 percent of all living adults who had ever smoked cigarettes had quit (3), and the prevalence of smoking among adults had decreased from 42 percent in 1965 to 26 percent (3,4). Most current smokers (83 percent) wish they had never started smoking (5). The social acceptability of using tobacco is declining, and increasingly it is being banned or restricted in public places and worksites (1).

Considerable progress still needs to be made. Most smokers who try to quit resume regular smoking within a year (6,7). One-third of adults who quit smoking for 1 year or longer may eventually relapse (6). The prevalence of smoking remains disproportionately high among American Indians and Alaskan Natives, blue-collar workers, and people with a high school education or less (1,3).

Given that tobacco use is preventable, that initiation occurs primarily during adolescence (4), and that regular users find cessation very difficult, interventions to prevent youth from initiating use are a primary focus of public health efforts to reduce overall tobacco use. Current data on the incidence and prevalence of tobacco use behaviors among youth can guide the design of these interventions.

This paper describes the development of questions related to tobacco use behaviors for the Youth Risk Behavior Surveillance System (YRBSS) questionnaire. The YRBSS Panel participants (see Appendix I, page 56) first identified major short- and long-term health

outcomes associated with tobacco use behaviors. Guided by national health objectives for the year 2000 (8), we developed questions that would elicit information on priority tobacco use behaviors among adolescents.

## Short-Term Health Outcomes

Some serious short-term health outcomes of tobacco use are associated with pregnancy and infant health. Twenty-two percent of 15- to 19-year-old mothers who gave birth in 1989 smoked cigarettes, compared with 19 percent of mothers ages 20 to 49 (9). Cigarette smoking among pregnant women causes intrauterine growth retardation, lower infant birth weight, and infant mortality (10,11). In 1988, approximately 2,500 infant deaths were attributed to maternal smoking (12).

The dose-response relationship between the number of cigarettes smoked during pregnancy and the infant's weight at birth is well documented. The prevalence of newborns weighing less than 2,500 grams is 54 percent greater among light smokers and 130 percent greater among heavy smokers than among nonsmokers. From 21 percent to 39 percent of the incidence of low birth weight is attributed to maternal cigarette smoking (10). Cigarette smoking seems to be a more significant determinant of birth weight than the infant's sex or the mother's height, weight, parity, or history of previous pregnancy outcome. Neither maternal appetite nor weight gain mediate the effect of cigarette smoking on birth weight (11).

Other serious short-term consequences of cigarette smoking occur in the respiratory and cardiovascular systems. Adolescent smokers, for example, exhibit higher rates of cough, sputum, and shortness of breath, and lower levels of physical fitness than do their non-smoking counterparts. Cigarette smoking also may influence the blood lipid levels of adolescents. Higher

levels of serum triglycerides and lower levels of high-density lipoproteins among adolescent smokers have been consistently reported (13).

### **Long-Term Health Outcomes**

In 1988, 434,000 deaths were attributed to cigarette smoking. These deaths resulted in 1,199,000 years of potential life lost (YPLL) before age 65 and 6,028,000 YPLL before age 85 (12). Smoking is responsible for one of every five deaths in the United States (12,14).

Tobacco use causes four of the five leading causes of death in the United States: cardiovascular disease (15), cancer (16), cerebrovascular disease (1), and chronic obstructive pulmonary disease (COPD) (17).

Cardiovascular disease is the most common cause of death in the United States (4). Dose-response relationships between cigarette smoking and death from cardiovascular disease have been demonstrated for the number of cigarettes smoked per day, the depth of inhalation, the age of initiation of cigarette smoking, and the number of years smoked. Smoking also increases the risk of heart attack recurrence among survivors of a heart attack (15). Former smokers, however, are less at risk for cardiovascular disease than are current smokers (6).

The 1964 Surgeon General's report on smoking and health recognized the causal link between cigarette smoking and lung cancer in males (18). Since this report was first published, extensive evidence has demonstrated that cigarette smoking also causes lung cancer in women (1). Dose-response relationships have been established between lung cancer and the number of cigarettes smoked per day, the depth of inhalation, and the age of initiation of regular smoking (16). Cessation of cigarette smoking results in a gradual decrease in lung cancer risk (6).

Lung cancer death rates have increased continually since the 1930s. Lung cancer is now the leading cause of cancer deaths among both men and women (19). The dramatic increase in lung cancer deaths among women since the 1960s is consistent with increases in the prevalence of cigarette smoking among women two to three decades earlier (1,20).

Cigarette smoking also causes other types of cancer, including laryngeal (16), oral (16), esophageal (16), and bladder (6). A strong dose-response relationship has been established between these four cancers and the number of cigarettes smoked per day (16). Smokers who quit reduce this increased risk for these cancers (6). Smoking operates synergistically with alcohol use to further increase risk for laryngeal, oral, and esophageal cancers (16). Cigarette smoking is estimated to account for about 40 percent of bladder cancer (1).

Oral cancer also is caused by use of smokeless to-

bacco, which includes moist or dry snuff and chewing tobacco. Oral cancer occurs more frequently among smokeless tobacco users than among nonusers and may be 50 times more frequent among long-term snuff users than among nonusers (4,21).

Cigarette smoking is a contributing factor for kidney cancer (1) and cancer of the uterine cervix (6). A dose-response relationship has been demonstrated between both kidney cancer and cervical cancer and the number of cigarettes smoked per day (1,16). Risk for cervical cancer declines gradually following smoking cessation (6).

Cigarette smoking also is a contributing factor for pancreatic cancer (1,16). Approximately 30 percent of pancreatic cancer is attributable to cigarette smoking (1). A dose-response relationship between cigarette smoking and pancreatic cancer for both men and women has been established (16). Risk for pancreatic cancer declines gradually following smoking cessation (6).

Stomach cancer is associated with cigarette smoking (1). Smokers have a small but consistently higher risk (about 1.5 times) of stomach cancer mortality than nonsmokers. A dose-response relationship has been demonstrated for the number of cigarettes smoked per day (16).

Cerebrovascular disease is the third leading cause of death in the United States (4). Cigarette smoking is a cause of cerebrovascular disease (1). A dose-response relationship has been noted, as has a decrease in risk following smoking cessation (6).

COPD is the fifth leading cause of death in the United States (4). Cigarette smoking contributes more to COPD incidence than any other risk factor (17). Cigarette smoking accounts for about 80 percent (1) of the more than 80,000 deaths from COPD that occur each year (4). COPD would be an uncommon condition in the United States if people did not smoke cigarettes (17).

### **National Health Objectives**

The national health objectives measured by the Youth Risk Behavior Surveillance System are given in Appendix III, page 67. Seven of the national health objectives for the year 2000, presented in "Healthy People 2000" (8) are relevant to tobacco use behaviors among adolescents. These objectives helped guide our selection of priority health behaviors.

Among the risk reduction objectives that concern tobacco use, objective 3.5 calls for reducing the initiation of cigarette smoking among youth, and objective 4.5 calls for increasing the average age at which adolescents (ages 12–17) have their first cigarette. Objective 3.9 calls for reducing smokeless tobacco use by males ages 12 through 24.

Services and protection objectives that concern tobacco use call for establishing tobacco-free environments and tobacco-use prevention curriculums as part of quality school health education in all schools (objective 3.10); enacting and enforcing laws that prohibit the sale and distribution of tobacco products to youth younger than 19 years (objective 3.13); increasing the number of States with plans to reduce tobacco use among youth (objective 3.14); and eliminating or severely restricting tobacco product advertising and promotion to which youth are exposed (objective 3.15).

## Priority Behaviors

To focus our development of questions related to tobacco use for the YRBSS, we selected, by priority, the following six behaviors: experimentation with cigarette smoking, age of smoking initiation, current pattern of cigarette smoking, regular cigarette smoking, smoking cessation, and use of smokeless tobacco. We chose these behaviors because of their relevance to national health objectives (8), their contribution to adverse health outcomes, their prevalence in subgroups of the population defined by age and sex, and their usefulness in describing various stages of smoking initiation (1).

Most adult cigarette smokers begin smoking during adolescence (1). For example, in 1991, 92 percent of people between the ages of 26–34 years who ever smoked cigarettes daily first tried smoking by age 18, and 73 percent were daily smokers by age 18 (personal communication with J. Gfroerer, National Institute on Drug Abuse, unpublished data). Experimentation—usually through taking a few puffs on a cigarette smoked by an older sibling, friend, or parent—often marks the beginning of the smoking initiation process.

Another milestone is the first time a person smokes a whole cigarette. Persons who begin smoking at younger ages are at increased risk of becoming regular smokers, of becoming heavy smokers, and of becoming ill or dying from smoking-attributable causes (1,22).

Current patterns of cigarette smoking can be defined in terms of frequency and intensity and may help explain the transition from experimentation to regular use. Regular cigarette smoking is important because it probably reflects dependency on nicotine. Regular cigarette smokers are likely to continue smoking over time and have difficulty quitting (1,6,7).

Smoking cessation is an important indicator of the success of public health efforts. Most programs for adolescents, however, except those for pregnant adolescents, tend to focus on the prevention of initiation rather than smoking cessation (23).

Most new users of smokeless tobacco are adolescent males (21). Between 1970 and 1986, snuff use increased

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fifteenfold and chewing tobacco use increased more than fourfold among 17- to 19-year-old males (1).

## YRBSS Questions

We developed nine questions to measure the selected behaviors. (See Appendix II, Youth Risk Behavior Surveillance System questionnaire, for the specific questions, page 60.) Experimentation with cigarette smoking is measured with two questions. Question No. 23 focuses on ever trying even one or two puffs of a cigarette. It was adapted from a similar question used in the Teenage Attitudes and Practices Survey (TAPS) conducted in 1989 by the Office on Smoking and Health (24). The second question (No. 24) addresses intention to try cigarette smoking which, though not a behavior, may precede experimentation with smoking (19). A "12-month" window was selected for this question to identify adolescents at risk of smoking initiation.

Age of smoking initiation is measured with question No. 25, adapted from a similar question used in TAPS. This question addresses the age when a whole cigarette is smoked for the first time. It can be used to measure objective 4.5 (8).

Two questions were developed to measure the current pattern of cigarette smoking. No. 28 focuses on frequency of use and the other, No. 29, focuses on intensity of use. Based on a National Cancer Institute recommendation for school-based questionnaires, a 30-day recall period was selected for both questions (25). Frequency is defined as the number of days per month during which at least one full cigarette is smoked. The question selected to measure frequency also was used in TAPS. Data from this question can be used to distinguish between current occasional and current regular use.

Intensity is defined as the average number of cigarettes smoked per day on the days smoking occurs. TAPS measured intensity with a series of questions about the number of cigarettes smoked on each of the 7 days preceding the survey. However, a single question focusing on the number of cigarettes smoked each day during the past 30 days was selected for the YRBSS. Data from this question can be used to identify light and

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heavy smokers. In addition, questions No. 28 and No. 29 can be used simultaneously to create various categories of current use.

Two questions were developed to measure the prevalence of regular cigarette smoking, which is defined as ever smoking at least one cigarette every day for 30 days. No. 26 asks whether the respondent has ever smoked cigarettes regularly; it was adapted from a similar question used in TAPS. The second question (No. 27) addresses the age when regular cigarette smoking began. Data from these questions can be used to measure objective 3.5 (8).

Question No. 30 was developed to measure smoking cessation; it also was adapted from the one used in TAPS. A 6-month recall period was selected, because this behavior is uncommon among adolescents and because laboratory and field tests conducted by the National Center for Health Statistics indicated adolescents had difficulty remembering this behavior for longer periods.

Smokeless tobacco use, including both chewing tobacco and snuff, is measured with question No. 31. Common brand names of smokeless tobacco products are used in this question to help adolescents identify types of chewing tobacco and snuff. A 30-day recall period was selected to provide a current measure of this behavior. This question can be used to measure objective 3.9 (8).

Since only a limited number of questions on tobacco use could be included in the YRBSS questionnaire, we could not measure other important tobacco use behaviors, such as smoking on school property; long-term attempts to quit smoking, particularly among regular smokers; age at which experimentation with cigarette smoking or occasional smoking first occurred; patterns of experimental smoking; smoking while pregnant; and attempts to quit smoking while pregnant.

Because the YRBSS was designed to focus primarily on behaviors, we did not include questions to measure the perceived tobacco-use behavior of peers or adults on school property, the perceived compliance with no-smoking rules on school property, the availability of

tobacco products to youth through over-the-counter and vending machine purchases, intention to smoke during pregnancy, perceived impact of advertising on tobacco-use behavior, and other determinants of tobacco-use behavior.

## Discussion

These nine YRBSS questions will provide important information about the nature and extent of priority tobacco-use behaviors among adolescents. Since the YRBSS is neither a one-time nor a categorical survey, it provides the opportunity to track behaviors over time and to examine the relationship between tobacco-use behaviors and other categories of health-risk behaviors, such as alcohol and other drug use. The YRBSS is also the only data source that can provide comparable, State-specific estimates of adolescent tobacco use for State and local officials.

Recognizing the addictive nature of nicotine and the powerful economic forces promoting tobacco use, public health officials are working hard to reduce the prevalence of tobacco use (26). The support of State and local education agencies, national organizations, voluntary health agencies, health care providers, religious organizations, the media, and others will be needed to plan and implement effective tobacco education policies and programs for adolescents.

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